

## The Standard Normal Distribution and Z-scores

What is a normal distribution?

We often convert raw data values in a normal distribution to \_\_\_\_\_, or \_\_\_\_\_ . These z-scores give us information about how any one data value compares to other data values in the distribution and allows us to compare data values in \_\_\_\_\_ populations.

**Definition of z-scores and formula:**

When \_\_\_\_\_ the raw data values in a normal distribution are converted to z-scores we have created the Standard Normal Distribution.

**Characteristics of a Standard Normal Distribution:**

Notice that a z-score is simply the distance between the observed value and the mean – measure in terms of standard deviations.

Another description: A z-score is a measure of \_\_\_\_\_. It describes the \_\_\_\_\_ of a value (in terms of standard deviations) relative to the mean.

So a z-score of \_\_\_\_\_ indicates that a value is \_\_\_\_\_ above the mean.

A z-score of \_\_\_\_\_ indicates that a value is \_\_\_\_\_ below the mean.

Flip the page for some examples.

Imagine that scores on a particular IQ test taken by 12-year-old children are normally distributed, with a mean of  $\mu = 100$  and a standard deviation of  $\sigma = 16$ . Jessica is a 12-year-old who scores 118 on this test.

1.) Take Jessica's IQ score and turn it into a z-score. In words, how would you interpret this z-score? What does the z-score tell you about how Jessica scores on this test compared to other 12-year-olds?

2.) Would you conclude that Jessica's score is unusual compared to other 12-year-olds? Why or why not?

**One important reason that we use z-scores is to compare values from two different populations.**

George is taking four courses at college this semester. In each of his courses, he must take a comprehensive final exam. Imagine that scores on the final exam in each of George's courses are normally distributed. The means and standard deviations for each of these courses are given in the table below. George's score on each final exam is also given in the table.

Course	George's final exam score	Mean ( $\mu$ )	Standard deviation ( $\sigma$ )
Philosophy	115	125	25
English	80	70	8
Trigonometry	105	113	20
World History	96	90	3

3.) Based on this information, in which class did George perform the best? Why?

4.) In which class did George perform the worst? Why?